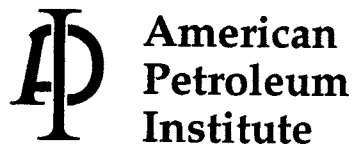


Closure of Underground Petroleum Storage Tanks

API RECOMMENDED PRACTICE 1604
THIRD EDITION, MARCH 1996

Reaffirmed 2001





One of the most significant long-term trends affecting the future vitality of the petroleum industry is the public's concerns about the environment. Recognizing this trend, API member companies have developed a positive, forward looking strategy called STEP: Strategies for Today's Environmental Partnership. This program aims to address public concerns by improving our industry's environmental, health and safety performance; documenting performance improvements; and communicating them to the public. The foundation of STEP is the API Environmental Mission and Guiding Environmental Principles.

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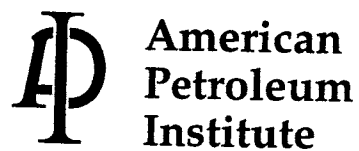
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- To recognize and to respond to community concerns about our raw materials, products and operations.
- To operate our plants and facilities, and to handle our raw materials and products in a manner that protects the environment, and the safety and health of our employees and the public.
- To make safety, health and environmental considerations a priority in our planning, and our development of new products and processes.
- To advise promptly, appropriate officials, employees, customers and the public of information on significant industry-related safety, health and environmental hazards, and to recommend protective measures.
- To counsel customers, transporters and others in the safe use, transportation, and disposal of our raw materials, products, and waste materials.
- To economically develop and produce natural resources and to conserve those resources by using energy efficiently.
- To extend knowledge by conducting or supporting research on the safety, health, and environmental effects of our raw materials, products, processes, and waste materials.
- To commit to reduce overall emission and waste generation.
- To work with others to resolve problems created by handling and disposal of hazardous substances from our operations.
- To participate with government and others in creating responsible laws, regulations, and standards to safeguard the community, workplace, and environment.
- To promote these principles and practices by sharing experiences and offering assistance to others who produce, handle, use, transport, or dispose of similar raw materials, petroleum products and wastes.

Closure of Underground Petroleum Storage Tanks

Manufacturing, Distribution and Marketing Department

API RECOMMENDED PRACTICE 1604
THIRD EDITION, MARCH 1996



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FOREWORD

Underground storage tank systems that have held flammable or combustible liquids should be handled with extreme care during closure in place, removal, storage, or disposal off site. This is particularly true of underground storage tanks at motor vehicle refueling facilities which are most frequently used for storage of motor fuel or other petroleum products.

The purpose of this recommended practice is to provide procedures for the closure in place, removal, storage, and the off-site disposal or sale of used underground tanks that have contained flammable or combustible liquids. Although this guide specifically addresses underground storage tank systems at service station facilities, the principles outlined may be applied to similar systems used at other petroleum facilities.

On September 23, 1988, the United States Environmental Protection Agency (EPA) issued its *Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks Systems (UST)*. These standards are Part 280 of Volume 40 of the *Code of Federal Regulations*. Furthermore, legislation and regulations on all aspects of UST management have been developed at state and local levels of government. These levels may have requirements other than those specified in the EPA *Technical Standards*, and the appropriate government agencies should be consulted about regulations that apply in the geographic area of interest before any action suggested by this recommended practice is taken. When used in this document, the term "implementing agency" means EPA or the designated state or local agency responsible for carrying out an approved UST program.

This recommended practice is based upon the experience of knowledgeable members of the petroleum industry. In some respects it may be more stringent than the requirements imposed by the *Technical Standards*. However, the recommended practice does not attempt to cover all of the subjects covered by the EPA *Technical Standards*. Furthermore, while substantial effort has been made to ensure that none of the recommendations contravene the requirements of the *Technical Standards*, API is not undertaking to interpret the *Standards* and cannot guarantee that its recommendations are completely in accord. Nor is any representation made that these recommendations conform with any requirements imposed by state and local agencies. This edition of API Recommended Practice 1604 supersedes the 1987 second edition in its entirety. The EPA *Technical Standards* provide that Recommended Practice 1604 can be used as a guide to compliance with EPA's requirements governing closure of USTs. According to EPA, an owner or operator conforms with this provision of the *Standards* if it uses the 1987 edition, which was in force when the *Standards* became final. However, an owner or operator who uses this amended version will also be meeting the requirement of the 1987 edition, and EPA encourages the use of the most recent version.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to assure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any federal, state, or municipal regulation with which this publication may conflict.

Suggested revisions are invited and should be submitted to the director of the Manufacturing, Distribution and Marketing Department, American Petroleum Institute, 1220 L Street, N.W., Washington, D.C. 20005.

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Closure of Underground Petroleum Storage Tanks

SECTION 1—GENERAL

1.1 Introduction

Underground petroleum storage systems that are no longer needed or suitable for product storage, or are not in compliance with applicable regulations and are not brought into compliance by upgrading or replacing, must be properly closed in place or removed to avoid future safety or environmental hazards. Because of the nature of the flammable or combustible liquids that are stored in these tanks, hazardous conditions may arise in the work area during disposal in place or removal and subsequent handling of tanks. For this reason, all personnel involved in the procedures outlined in this recommended practice should be familiar with the potential hazards, and be knowledgeable in the appropriate health and safety measures needed to ensure a safe working environment.

1.2 Scope and Purpose

1.2.1 This publication recommends procedures for the closure in place, removal, storage, and off-site disposal of underground storage tank systems that have contained flammable or combustible fluids. In general, it outlines requirements, procedures, and operating conditions to be followed by contractors, engineers, and other individuals who may be involved in these practices. While this recommended practice specifically addresses underground petroleum storage tank systems at service station facilities, the principles outlined may be applied to similar systems used at other petroleum storage facilities. All such work must be accomplished in accordance with federal, state, and local requirements as well as accepted safety standards.

Before initiating work, the appropriate government agencies should be notified and consulted concerning applicable regulatory and permit requirements.

1.2.2 All applicable permits must be obtained prior to beginning any work. Certified or licensed contractors may be required in some states. Consult the implementing agency for contractor requirements. Contractors, subcontractors, and their employees responsible for tank closure in place or removal should be familiar with:

- a. All applicable safety rules and regulations, including OSHA's *Occupational Safety and Health Standards* (29 *Code of Federal Regulations* Part 1910).
- b. The use of equipment and procedures for testing and vapor-freeing tanks.
- c. The handling and disposal of the types of wastes likely to be encountered
- d. The applicable sections of the publications referenced in 1.4.

1.2.3 Under applicable federal regulations, including 40 *Code of Federal Regulations* Part 280, an underground storage tank system (UST) consists of the underground storage tank and the connected underground piping, underground ancillary equipment and containment system, if any. The procedures outlined in this recommended practice can be applied to all portions of an underground storage tank system.

1.2.4 The procedures outlined in this recommended practice can be carried out without entering the tank. Should tank entry be desired, the procedures outlined in API Standard 2015 and Publication 2217 and Recommended Practice 1631 should be followed. See also 29 *Code of Federal Regulations* Part 1910.147 regarding "Permit required confined space."

1.3 Special Precautions

During underground storage tank removal or in-place disposal, workers may be exposed to petroleum hydrocarbon liquids, vapors, or wastes. The precautions in 1.3.1 and 1.3.2 should be observed by all individuals engaged in the procedures discussed in this recommended practice.

1.3.1 TOXICITY CONSIDERATIONS FOR PETROLEUM SUBSTANCES

All personnel should be aware of appropriate health precautions. When high concentrations of petroleum hydrocarbon vapors are inhaled, symptoms of intoxication may result. These symptoms, ranging from dizziness to excitement or unconsciousness, are similar to those produced by alcohol or anesthetic gases. If such effects occur, the individual should be removed to fresh air. For minor effects of exposure, breathing fresh air or oxygen results in rapid recovery. If breathing has stopped, artificial respiration should be applied promptly. Medical attention should be obtained as soon as possible. Paragraphs 1.3.1.1 and 1.3.1.2 contain special toxicity considerations for benzene and tetraethyl lead, which may be present in petroleum products or wastes found in or around underground storage tanks. Care should be exercised to minimize exposure to these substances when they are present during the handling of used underground petroleum storage tanks.

WARNING: Tests have shown that prolonged or repeated exposure to some petroleum substances, in liquid or vapor form, may cause serious illness, including cancer, in laboratory animals. Although the significance of these test results to human health is not fully understood, exposure to

petroleum substances should be minimized. The following health precautions are suggested:

- a. Avoid skin contact and inhaling vapors.
- b. Keep petroleum liquids away from eyes, skin, and mouth; they can be harmful or fatal if inhaled, absorbed through the skin, or ingested.
- c. Use soap and water or waterless hand cleaner to remove any petroleum product that contacts skin. Do not use gasoline or similar solvents to remove oil and grease from skin.
- d. Promptly wash petroleum-soaked clothes and avoid using soaked leather goods. Properly dispose of rags.
- e. Keep work areas clean and well ventilated.
- f. Clean up spills promptly.

1.3.1.1 Benzene

High occupational exposures to benzene have been associated with various human blood disorders, including an increased risk of leukemia. Very high levels have also been known to affect the central nervous system. Benzene administered by mouth has induced cancer in laboratory animals in long-term tests. Benzene is rapidly absorbed through the skin. The Occupational Safety and Health Administration (OSHA) imposes limits on occupational exposure and requirements concerning the communication of hazards to workers. See 29 *Code of Federal Regulations* Parts 1919.1000 (Table A-2), 1910.1028, and 1910.1200.

1.3.1.2 Tetraethyl Lead

This organic form of lead can cause diseases of the central and peripheral nervous system, the kidney and the blood. Skin absorption of this compound is a major route of entry into the body. The ACGIH time-weighted average is 0.1 milligrams per cubic meter for general room air. The TLV in OSHA's Occupational Safety and Health Standards (29 *Code of Federal Regulations* Part 1910.1000, Table Z-1) is 0.075 milligrams per cubic meter.

1.3.2 FLAMMABILITY AND COMBUSTIBILITY CONSIDERATIONS

1.3.2.1 Flammable or combustible vapors are likely to be present in the work area. The concentration of vapors in the tank, the excavation, or the work area may reach the flammable or explosive range before venting is complete and a safe atmosphere is reached. Therefore, the following precautions must be taken:

- a. Eliminate all potential sources of ignition from the area (for example, smoking materials, and nonexplosion-proof electrical and internal combustion equipment).
- b. Prevent the discharge of static electricity during venting of flammable vapors.

- c. Prevent the accumulation of vapors at ground level.

Refer to API Standard 2015 and API Recommended Practice 2003 for general precautionary measures to follow during the vapor-freeing procedure.

1.3.2.2 A combustible gas indicator (CGI) should be used to check for hazardous vapor concentrations in and around the work area (see 4.4). For tanks that have been vapor-freed with an inert gas, combustible gas indicator readings may be misleading (see 4.4.3). All open flame and spark-producing equipment within the vapor hazard area should be shut down. Electrical equipment (for example, pumps and portable hand tools) used in the area must be explosion-proof in accordance with NFPA 70B Class I, Division I, Group D or otherwise approved for use in potentially explosive atmospheres.

1.4 Referenced Publications

Portions of the following documents contain information regarding various engineering and safety procedures that may be applicable to underground storage tank removal or disposal.

API

- Publ 1628 *A Guide to the Assessment and Remediation of Underground Petroleum Releases*
- Publ 1629 *A Guide for Assessing and Remediating Petroleum Hydrocarbons in Soils*
- Std 2015 *Safe Entry and Cleaning of Petroleum Storage Tanks, Planning and Managing Tank Entry from Decommissioning Through Recommissioning*
- Publ 2217A *Guidelines for Work in Inert Confined Spaces in the Petroleum Industry*
- Publ 2219 *Safe Operating Guidelines for Vacuum Trucks in Petroleum Service*
- RP 1631 *Interior Lining of Underground Storage Tanks*
- RP 2003 *Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents*

NFPA¹

- 70B *Electrical Equipment Maintenance*
- 326 *Safe Entry of Underground Storage Tanks*
- 327 *Standard Procedure for Cleaning or Safe-guarding Small Tanks and Containers*

OSHA²

- 29 *Code of Federal Regulations* Part 1910 (Occupational Safety and Health Standards)

¹National Fire Protection Agency, 1 Batterymarch Park, P.O. Box 9101, Quincy, Massachusetts 02269-9101.

²Occupational Safety and Health Administration, U.S. Department of Labor, Washington, D.C. 20402. The *Code of Federal Regulations* is available from the U.S. Government Printing Office, Washington, D.C. 20402.

EPA³

40 *Code of Federal Regulations* Parts 260, 261, 262, 280
(General Regulations for Hazardous Waste
Management)

(Regulations for Identifying Hazardous Waste)
(Regulations for Hazardous Waste Generators)
(Underground Storage Tanks Regulations)

SECTION 2—TEMPORARILY OUT OF SERVICE

2.1 Applicability

A UST is considered temporarily out of service if it is idle but (a) will be returned to service, (b) is awaiting closure in place, (c) is awaiting removal.

A UST that meets the EPA's standards for new tanks or that has been upgraded in accord with EPA requirements can remain in the status of "temporarily out of service" indefinitely. A UST that does not meet EPA standards must be permanently removed from service after 12 months unless the implementing agency grants an extension. A site assessment must be completed before an extension can be applied for. State and local codes may be more stringent.

2.2 Securing Tank Systems

Tanks temporarily out of service must be properly secured for the period they will be out of service. Tanks may be considered properly secured if processed as follows:

- a. Observe all special precautions described in 1.3.
- b. Remove stored product from the tank and lines. A tank is considered empty if less than 2.5 centimeters (1 inch) of

residue or less than 0.3 percent of the capacity of the system remain in the tank. If the tank is not empty, release detection or protection measures must be continued. One of the following methods may be used to remove product from the tank:

1. Drain all product lines into the tank, then remove all liquids from the tank.
 2. Remove all flammable or combustible liquids with the exception of a sufficient quantity (approximately four inches) to assure a saturated vapor space.
 3. When high water table or flooding conditions exist, remove all stored liquid and ballast the tank by filling with water.
- c. Cap and secure all openings against tampering, including the fill pipe, gauge pipe, tank truck vapor recovery fitting, and vapor return.
 - d. Cap and secure the product lines at the service station island, or elsewhere if the pumps are removed, or leave the pumps connected and locked. Disconnect or lock-out the electric power to the pumps.
 - e. Leave the vent line open.
 - f. Consult appropriate local, state, or federal agencies concerning regulatory notification requirements.

SECTION 3—GENERAL REQUIREMENTS FOR PERMANENT CLOSURE AND CHANGE OF SERVICE

3.1 Applicability

Permanent closure of a UST can take place through closure in place or removal from the ground in accordance with local regulations. A change of service (that is, conversion of the UST to storage of a non-regulated substance) should also be subject to many of the safeguards that apply to permanent closure.

3.2 Notification

The implementing agency must be notified at least 30 days before permanent closure or change of service is begun.

3.3 Pre-Closure Evaluation

3.3.1 Prior to permanent closure or change of service, an evaluation of the site should be conducted to:

- a. Determine the potential for encountering contaminated backfill, soil or water that may require special handling.

³U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460. The *Code of Federal Regulations* is available from the U.S. Government Printing Office, Washington, D.C. 20402.

- b. Determine the need to dewater the excavation.
- c. Identify an area for stockpiling excavated backfill and soils.
- d. Identify an area for temporary storage of the tanks and lines that have been removed.

3.3.2 When the existing underground storage tank and lines are partially or totally removed, the backfill and soil encountered may contain concentrations of petroleum that are above allowable concentrations under applicable regulations (that is, petroleum contaminated soil). Petroleum contaminated soil can be the result of minor spills and drips or other releases that occurred during the previous operation of the facility or by minor spills and drips during removal of equipment, despite efforts to drain and pump product from the equipment before removal. Excavated backfill and soil should be properly evaluated and stockpiled in accordance with applicable regulations for petroleum contaminated soils (see API Publications 1628 and 1629). The implementing agency should be consulted concerning any requirements for notification, site assessment, or corrective action.

3.4 Closure Assessment

Following notification, but before closure or change of service is complete, a site assessment must measure for the

presence of a release at those places where contamination is most likely to be found. If the UST has been subject to release detection in the form of vapor monitoring, ground water monitoring, interstitial monitoring (in the form of monitoring between the walls of double wall tanks or observation wells), and if no release is indicated, then further site assessment may not be necessary.

3.5 Corrective Action

If the site assessment indicates that a release has occurred, then appropriate further evaluation and corrective action must be undertaken (see API Publications 1628 and 1629).

3.6 Recordkeeping

Records demonstrating compliance with closure requirements must be maintained. The results of any site assessment of the excavation must be maintained for at least three years. These records can be kept by the owners and operators who took the tank out of service, by the current owners of the site, or by mailing the records to the implementing agency.

SECTION 4—PERMANENT CLOSURE AND CHANGE OF SERVICE

4.1 Applicability

The processes described in 4.2 through 4.4 should be followed prior to the removal or closure in place of a UST.

4.2 Preparation

4.2.1 Observe the special precautions described in 1.3.

4.2.2 Drain product piping into the tank, being careful to avoid any spillage to the excavation area. Small quantities of water may be used to flush the piping. When water is used to flush the piping, the amount of water should be minimized. No more than 1 gallon of water per ten feet of 1½ inch diameter piping or 2 gallons of water per 10 feet of 2 inch diameter piping should be used. Disconnect product piping from the tank, and remove the piping where accessible.

4.2.3 Remove liquids and residues from the tank by using explosion-proof or air-driven pumps. Small quantities of water may be used to rinse the tank and enhance the removal of residues from the tank. The amount of water used should be minimized to less than 1 inch of water in the bottom of the tank. During removal of liquids or residues from a tank, it is likely that air will enter the tank and may bring the tank atmosphere into the flammable range. Extra

care should be taken during removal operations. For a complete description of safety precautions, refer to API Standard 2015. Pump motors and suction hoses must be bonded to the tank or otherwise grounded to prevent electrostatic ignition hazards. It may be necessary to use a hand pump to remove the last few inches of liquid from the bottom of the tank. If a vacuum truck is used for removal of liquids or residues, the area of operation for the vacuum truck must be vapor-free. The truck should be located upwind from the tank and outside the path of probable vapor travel. The vacuum pump exhaust gases should be discharged through a hose of adequate size and length downwind of the truck and tank area. See API Publication 2219 for vacuum truck operating and safety practices.

4.2.4 Excavate to the top of the tank. It is recommended that asphalt, concrete and piping be removed and separated from the excavated backfill and soil to minimize the amount of material that may need special handling.

4.2.5 Remove the fill pipe, gauge pipe, vapor recovery truck connection, submersible pumps, and other tank fixtures. Remove the drop tube, except when it will be used to vapor-free the tank with an eductor as specified in 4.3.5. Remove all non-product lines, such as vapor recovery lines, except for the vent line. The vent line should remain

connected until the tank is purged (see 4.3.1 through 4.3.7). Temporarily plug all other tank openings so that all vapors will exit through the vent line during the vapor-freeing process.

4.3 Purging and Inerting

4.3.1 *Purging* is the removal of flammable vapors from a tank to deprive a potential fire of any source of fuel. *Inerting* is the displacement of oxygen from a tank (and the incidental removal of some vapors) to deprive a potential fire of a source of oxygen. A tank may be inerted by one of the methods described in 4.3.3 or 4.3.4. A tank may be purged by one of the methods described in 4.3.5, 4.3.6, or 4.3.7. A tank may continue to be a source of flammable vapors even after following one of these procedures. Therefore, caution must always be exercised when handling or working around tanks that have stored flammable or combustible liquids. Immediately before initiating work in the tank area or on the tank, a combustible gas indicator should be used to assess vapor concentrations in the tank and work area.

4.3.2 Both purging and inerting cause the displacement of vapors from the tank. All vapors should be vented from the tank at a minimum height of 12 feet above grade and 3 feet above any adjacent roof lines. The work area should be free from sources of ignition (see 1.3.2). Appropriate local, state, or federal agencies should be consulted concerning regulatory requirements for air discharges.

4.3.3 A tank may be inerted with an inert gas such as carbon dioxide (CO₂) or nitrogen (N₂). This method should not be used if the tank is to be entered for any reason, since the tank atmosphere will be oxygen deficient. The inert gas should be introduced through a single tank opening at a point near the bottom of the tank at the end of the tank opposite the vent. When inert gases are used, they should be introduced under low pressure to avoid the generation of static electricity. When using CO₂ or N₂, pressures in the tank should not exceed 5 pounds per square inch gauge.

CAUTION: Introducing compressed gases into the tank may create a potential ignition hazard as the result of the development of static electrical charges. The discharging device and the tank must, therefore, be grounded. Explosions have resulted from the discharging of CO₂ fire extinguishers into tanks containing a flammable vapor-air mixture. CO₂ extinguishers should not be used for inerting flammable atmospheres.

4.3.4 If the method described in 4.3.3 is not practical, a tank can be inerted by adding solid carbon dioxide (that is, dry ice) to the tank in the amount of at least 1.5 pounds per 100 gallons of tank capacity. The dry ice should be shaved or crushed and distributed evenly over the greatest possible area in the tank to promote rapid evaporation. As the dry ice vaporizes, flammable vapors will flow out of the tank

and may surround the area. Therefore, where practical, plug all tank openings except the vent after introducing the solid CO₂ and continue to observe all normal safety precautions regarding flammable or combustible vapors. Make sure that all of the dry ice has evaporated before proceeding.

CAUTION: Skin contact with dry ice may produce burns.

4.3.5 Flammable vapors may be purged from the tank by one of two methods of tank ventilation listed below:

a. Ventilation using an eductor-type air mover usually driven by compressed air (see Figure 1). The eductor-type air mover must be properly bonded to prevent the generation and discharge of static electricity. When using this method, the fill (drop) tubes that are not removable should be purged. An eductor extension shall be used to discharge vapors a minimum of 12 feet above grade and 3 feet above any adjacent roof lines.

b. Ventilation with a diffused air blower (see Figure 2). When using this method, the air-diffusing pipe must be properly bonded to prevent the discharge of a spark. Fill (drop) tubes must be removed to allow proper diffusion of the air in the tank. Air supply should be provided from a compressor that has been checked to ensure a clean air supply and that is free from volatile vapors. Air pressure in the tank must not exceed 5 pounds per square inch gauge.

4.3.6 One of the safest and simplest methods for vapor-freeing a tank is to fill the tank with water. However, thousands of gallons of water may be used in the vapor-freeing process and the water may be subject to regulatory requirements requiring special storage, handling, treatment and disposal, making this method cost-prohibitive. All water used in this method should be tested prior to disposal. Before employing the method described in 4.3.6.1 through 4.3.6.3, consult applicable federal, state and local regulations.

4.3.6.1 Fill the tank with water until the floating product nears the fill opening. Remove the floating product and place it in a suitable container for proper disposal. Ensure that neither product nor water is spilled into the tank excavation. Hose should not be attached directly to the tank, since city main pressure may produce a hydraulic shock that could rupture the tank.

4.3.6.2 While filling the tank with water, flammable vapors will be expelled through both the vent and fill opening, but primarily at the fill opening. Normal safety precautions should be observed. To minimize the escape of vapor through the fill opening, the opening may be temporarily capped. Do not overfill the tank.

4.3.6.3 When the tank is free of vapor, pump out the water and dispose of it in accordance with applicable federal, state, and local regulations.

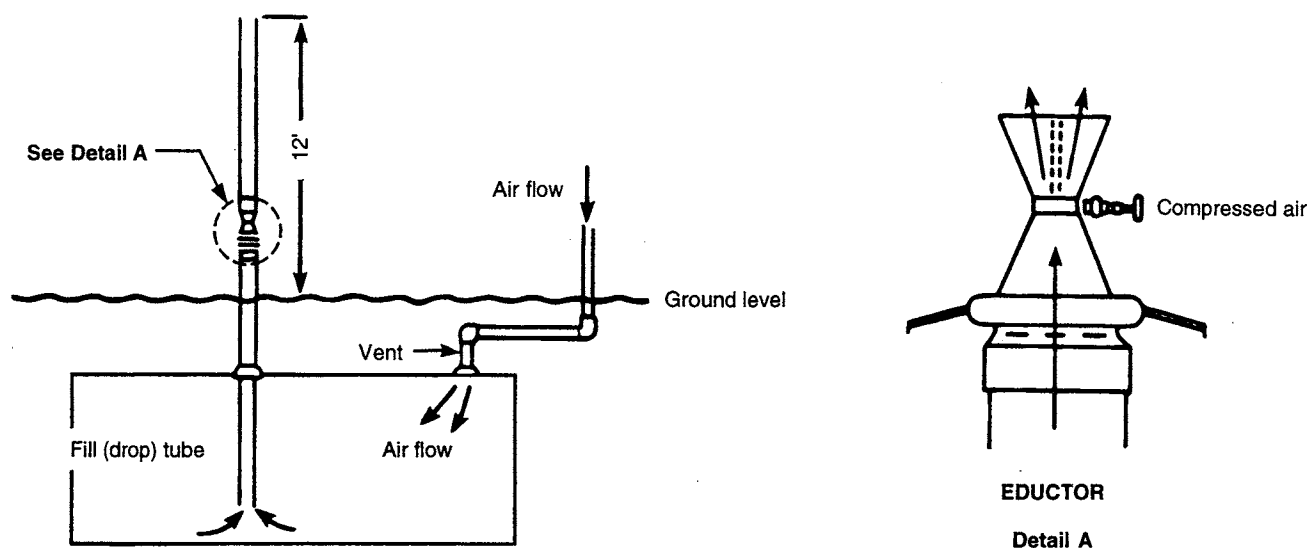
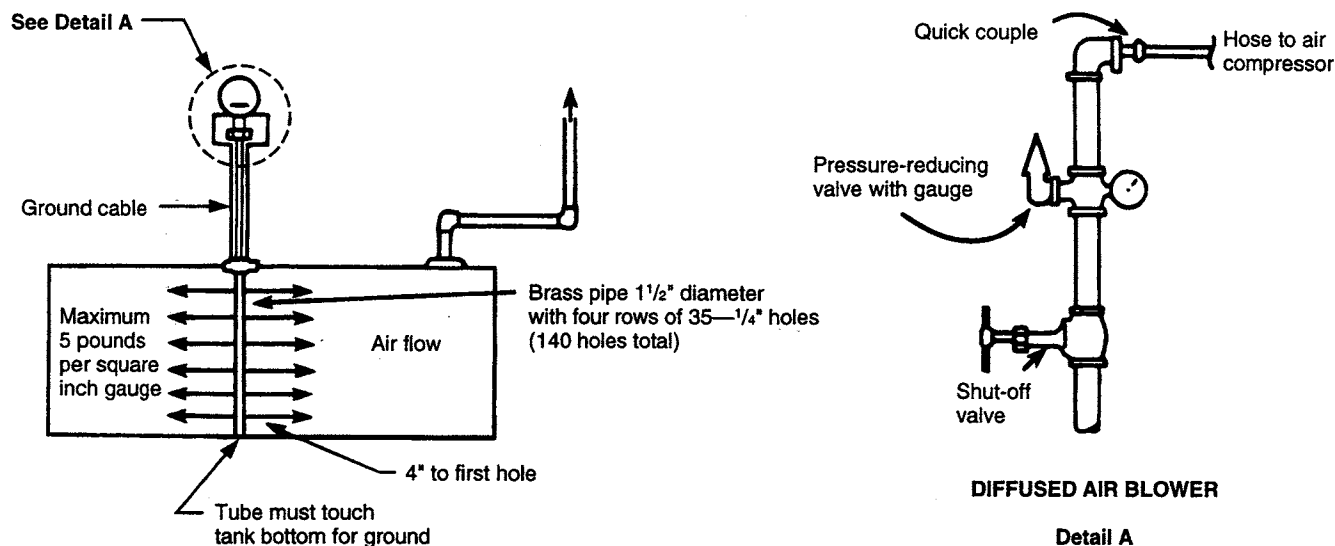


Figure 1—Eductor-Type Air Mover



Note: Ground cable brazed to pipe must be clamped to fill (drop) tube. Use 12 gauge ground wire from fill (drop) tube to water pipe or ground rod.

Figure 2—Diffused Air Blower

4.3.7 Steam can be used to clean and vapor-free a tank. However, a large static charge can build up in the nozzle of the steam jet. Insulated objects on which the steam impinges can also become charged. If steam is to be used for either purging or cleaning a tank or other equipment, the steam discharge nozzle and all conductive insulated objects subject to impingement or condensation should be bonded to the tank or be grounded. Steam purging of tanks should be avoided when suitable alternatives are available. For additional information on steam cleaning of tanks, refer to NFPA 327.

4.4 Testing

4.4.1 The tank atmosphere and the excavation area should be regularly tested for flammable or combustible vapor concentrations until the tank is removed from both the excavation and the site. Such tests are to be made with a combustible gas indicator which is properly calibrated according to the manufacturer's instructions (typically on pentane or hexane in air), and which is thoroughly checked and maintained in accordance with the manufacturer's

instructions. Personnel responsible for testing must be completely familiar with the use of the instrument's readings. Always test the environment for oxygen content first to insure accuracy of subsequent testing.

4.4.2 Test the tank vapor space by placing the combustible gas indicator probe into the fill opening with the drop tube removed. At a minimum, readings should be taken at the bottom, middle, and upper portions of the tank through an easily accessible opening, and the instrument should be cleared after each reading. If the tank is equipped with a non-removable fill tube, readings should be taken through another opening. Liquid product must not enter the probe. Readings of 10 percent or less of the lower explosive limit must be obtained before the tank is considered safe for removal from the ground. For additional information, refer to NFPA 325M, Sections 1 through 3.5.

4.4.3 Combustible gas indicator readings may be misleading where the tank atmosphere contains less than 5 percent by volume oxygen, as in a tank vapor-freed with CO₂, N₂, or another inert gas. In general, readings in oxygen-deficient atmospheres will be on the high, or safe, side. It is desirable to use an oxygen indicator to assess the oxygen concentration when an inert gas has been used to vapor-free a tank.

4.5 Closure in Place

4.5.1 This section describes a safe method for the in-place closure of underground tanks, but removal of the tank is preferred (see 4.6). Closure of the tank in place should be considered in the following circumstances:

- a. Because of the tank location, adjacent equipment or structures may be damaged or weakened if the tank is removed.
- b. Removal may be physically impossible.
- c. Removal may incur excessive costs.

A determination of whether to close a tank in place or to remove it will depend upon:

- a. Local regulations which may prohibit or restrict closure in place.
- b. The location of the facility and tank.
- c. The availability of equipment.
- d. Cost.

4.5.2 The federal Resource Conservation and Recovery Act (40 *Code of Federal Regulations* Parts 260–265) places restrictions on disposal of certain residues that may be present in some underground storage tanks. Residues from tanks that have held gasoline or other petroleum products should be treated with extreme caution. Residues in the tank may be classified as hazardous wastes. All liquids and residues removed from the tank should be tested and handled in accordance with appropriate federal, state, and local

regulations. Product removed from the tank can usually be reused or recycled.

4.5.3 One or more holes may be cut in the tank top using explosion-proof non-sparking tools if existing tank openings are not adequate for introduction of the inert material to be used to fill the tank.

4.5.4 Introduce a suitable solid inert material through openings in the top of the tank. It is important to fill the tank as full as possible with the sand or other inert material. The procedures in 4.5.4.1 through 4.5.4.3 are intended to minimize any surface settling subsequent to the disposal of the tank in place.

4.5.4.1 Sand will flow readily and is generally available. Any kind of sand is suitable if it is free of rocks, which might limit leveling-out in the tank. The sand may be introduced dry as long as it flows in freely. When the sand cone nears the top of the tank, the sand can be washed into the tank with a nominal amount of water and puddled to cause it to flow to the ends. The use of larger amounts of water should be avoided since the tank might be filled with water before it is filled with sand.

4.5.4.2 Almost complete filling of the tank can be achieved by using a combination of sand and earth. Fill the tank with sand to approximately 80 percent of calculated capacity. Mix soil and water to make a free-flowing mud and pour the mixture into the tank opening. Puddle the mixture until the tank is full and overflows the fill opening.

4.5.4.3 Other types of inert materials, slurries, or expandable materials such as polyurethane foams may be used when approved by regulatory officials.

4.5.5 After the tank is filled with inert material, all tank openings should be covered, plugged, or capped, and the excavation should be backfilled.

4.5.6 Disconnect and remove the vent line, if accessible. If the vent line is not accessible, remove the portion above the surface and cap both ends.

4.6 Removal

4.6.1 After the tank has been freed of vapors and before it is removed from the excavation, plug or cap all accessible holes. One plug should have a 1/8-inch vent hole to prevent the tank from being subjected to excessive differential pressure caused by temperature changes. The tank should always be positioned with this vent plug on top of the tank during subsequent transport and storage.

4.6.2 Excavate around the tank to uncover it for removal. Remove the tank from the excavation and place it on a level surface. Applicable regulations may require removal of all backfill material prior to conducting the closure assessment.

Consult the implementing agency prior to removal activities. Use wood blocks to prevent movement of the tank after removal and prior to movement of the tank after removal and prior to loading on a truck for transportation. Ensure that any residues that may remain in the tank are contained and prevented from reaching the soil. Use screwed (that is, boiler) plugs to plug any corrosion holes in the tank shell.

4.6.3 Excavate around the piping to uncover it for removal. Remove the piping from the excavation and place it on a flat surface. Applicable regulations may require removal of all backfill material prior to conducting the closure assessment. Consult the implementing agency prior to removal activities. Ensure that any residues that may remain in the piping are contained and prevented from reaching the soil.

4.6.4 If tanks are not cut up or crushed on-site, tanks should be labeled after removal from the ground but prior to removal from the site. Regardless of the condition of the tank, the label should contain a warning against certain types of reuse. The former contents and present vapor state of each tank, including vapor-freeing treatment and date should also be indicated. The label should be similar to the following in legible letters at least 2 inches high:

Note: The exact wording of the label is not as important as the information contained on the label.

TANK HAS CONTAINED LEADED GASOLINE*
NOT VAPOR-FREE
NOT SUITABLE FOR STORAGE OF FOOD OR
LIQUIDS INTENDED FOR HUMAN OR ANIMAL
CONSUMPTION
DATE OF REMOVAL: MONTH/DAY/YEAR

*Or other flammable or combustible liquid. Use the applicable designation (for example, DIESEL).

4.6.5 Tanks that have held leaded motor fuels (or whose service history is unknown) should also be clearly labeled with the following information:

TANK HAS CONTAINED LEADED GASOLINE
LEAD VAPORS MAY BE RELEASED IF HEAT IS
APPLIED TO THE TANK SHELL

4.6.6 Tank should be cut up, crushed, or removed from the site as promptly as possible after vapor-freeing procedures have been completed, preferably on the day of tank removal from the excavation. If a tank remains at the site overnight or longer, additional vapor may be released from any liquid absorbed in the tank walls or residues remaining in the tank.

4.6.6.1 Immediately before the tank is removed from the site, the tank atmosphere should be checked with a combustible gas indicator as specified in 4.4 to ensure that it does not exceed 10 percent of the lower explosive limit.

4.6.6.2 The tank should be secured on a truck for transportation to the storage or disposal site with the 1/8-inch vent hole located at the uppermost point on the tank. Tanks should be transported in accordance with all applicable local, state, and federal regulations.

4.7 Change of Service

4.7.1 Before a change of service, an UST must be emptied and cleaned. Procedures outlined in 4.2.1 through 4.2.3 should be followed. Additional preparation may be necessary based on the new material to be stored in the UST.

4.7.2 Any new service should be compatible with the former service. The precautions described in 4.6.4 and 4.6.5 should be observed.

SECTION 5—STORAGE OF USED TANKS

5.1 Storage Considerations

Although used tanks that have contained flammable or combustible liquids have been vapor-freed at one time, they cannot be guaranteed to remain vapor-free. Hydrocarbons may be retained in crevices and under scale and may be released when disturbed or over a period of time. It is important, therefore, that appropriate safety precautions be observed at all times.

5.2 Storage Procedures

5.2.1 Tanks should be vapor-freed before being placed in storage (see 4.3). Tanks should also be free of all liquids

and residues. All tank openings should be tightly plugged or capped, with one plug having a 1/8-inch vent hole to prevent the tank from being subjected to excessive differential pressure caused by temperature changes. Tanks should be stored with the vented plug at the highest point on the tank. All tanks should be labeled as described in 4.6.4 and 4.6.5.

5.2.2 Used tanks should be stored in secure areas on the premises of persons familiar with any attendant hazards and where the general public will not have access. A fenced yard, apart from other facilities, is desirable.

SECTION 6—SALE FOR REUSE

6.1 Considerations for Reuse

Careful consideration should be given to the reuse of tanks that have been in petroleum storage service. If a tank is sold for reuse, the purchaser should be given a very clear understanding of the former use and present condition of the tank. The seller of a tank to be returned to service in an underground petroleum storage system must inform the purchaser of the tank of the owner's notification requirements under applicable federal regulations (see 40 *Code of Federal Regulations* Part 280.22). Similar state or local regulations may also apply. Buyers of such tanks should check with the original manufacturer of the tank to determine its suitability for reuse. It is advisable to test the tanks for flammable vapors before they are transported (see 4.4).

6.1.1 Tanks that are to be reused must be recertified by the original manufacturer prior to reuse. Consult applicable regulations prior to reuse

6.1.2 After the tank has been vapor-freed, tanks that are to be reused should be stored in a secure area with all openings

capped or plugged. One of the plugs should have a 1/8-inch vent hole.

CAUTION: Tanks that previously contained gasoline must not be used for drainage culverts or the subsequent storage of food or liquids intended for animal or human consumption.

6.2 Conditions of Sale

A bill of sale should be used to transfer tank ownership. The bill of sale should include the purchaser's acknowledgment that the purchaser assumes all liability related to the tank. Bills of sale should indicate the former use of the tank and carry the following warning regardless of the former contents of the tank:

TANK HAS CONTAINED LEADED GASOLINE*
NOT VAPOR-FREE
NOT SUITABLE FOR STORAGE OF FOOD OR
LIQUIDS INTENDED FOR HUMAN OR ANIMAL
CONSUMPTION

*Or other flammable or combustible liquid. Use the applicable designation (for example, DIESEL).

SECTION 7—DISPOSAL

7.1 Disposal Criteria

7.1.1 Tanks should be disposed of when they are no longer fit for the storage of flammable or combustible liquids or any other appropriate use. Whether sold to a scrap dealer or disposed of at an acceptable facility, sufficient holes should be made in the tanks to render them unfit for further use.

7.1.2 Tanks that have been lined internally or coated externally with epoxy-based or similar materials may not be accepted by scrap processors. Prior inquiries should be made to ascertain the requirements of the processor accepting the tank for scrap.

7.2 Disposal Procedures

7.2.1 After a tank has been vapor-freed, tanks that are to be sold as scrap or disposed of should be perforated by puncturing, cutting, or drilling numerous holes in all sections of the tank, or cut up or crushed on-site to ensure that the tank cannot be reused. Use explosion-proof non-sparking tools.

7.2.2 Tanks that are not cut up or crushed on-site should be labeled as described in 4.6.4 and 4.6.5.

7.2.3 A bill of sale should be used to transfer tank ownership (see 6.2).

7.2.4 Prior to disposal of used tanks, current federal, state, and local regulations should be checked to determine if special procedures or preparations are required.

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